

Human Machine Interaction Using Dynamic Hand Gesture Recognition

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Abstract- This is an easy, user-friendly way to interact with robotic systems and robots. An accelerometer is used to detect the tilting position of your hand, and a microcontroller gets different analogue values and generates command signals to control the robot. This concept can be implemented in a robotic arm used for welding or handling hazardous materials, such as in nuclear plants.

Index Terms- Gesture, Hand, Gesture recognition, Human computer interaction, Recognition

I. INTRODUCTION

Technology has assisted humans in today's culture by enhancing workplace efficiency, regardless of hazardous working circumstances or a complex environment. Robots have simplified work to a simple process in a variety of fields, from medicine to industry. Even as technology progresses, it will never be able to complete any job without the supervision of its master, i.e., humans. Apart from using external devices to control robots, simple gestures are the most natural and effective way to communicate with them gadget it becomes quite hard and complicated when there comes the part of controlling it with remote or many different switches. Mostly in military application, industrial robotics, construction vehicles in civil side, medical application for surgery. In this field it is quite complicated to control the robot or particular machine with remote or switches, sometime the operator may get confused in the switches and button itself, so a new concept is introduced to control the machine with the movement of hand which will simultaneously control the movement of robot.

II. LITERATURE REVIEW

1. The Gesture Controlled Robot

Dr. C.K. Gomathy, Mr. G. Niteesh, Mr .K. Sai Krishna

A robot is the system which deals with construction, design and operation. This system is related to robot and their design, manufacture, application. Robotics is currently focused on developing systems that modularity, flexibility, redundancy, fault tolerance and some other researchers are on completely automating a manufacturing process or a task, by providing sensor based to the robot arm. Recently developing industry and man power are critical constraints for completion of task. To save human efforts the automation playing important role in the system. This system is used for regular and frequently

carried work. One of the major and most commonly performed works is picking and placing of jobs from source to destination. In the earlier systems, the motion of the human hand is sensed by the robot through sensors and it follow the same. As the human travels their hand, the accelerometer also starts moving accordingly motion of the hand sensor displaces and this sensor senses object or parameter according to motion of hand.

2. Gesture Control Robot

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This is Real time monitoring system, by which humans interacts with robots through gestures. This is an immense aid for people for whom mobility is a great challenge. There is need for vision based interface over speech recognition as it failed to mandate the robots because of modulation and varying frequency. The implementation is achieved by navigation of the robot through various gestures. By the impact of this project, life of physically challenged people becomes less challenging. It will benefit various areas including applications in military and high security bases. Gesture control robot consist of two stages: capture image and data extraction. Objects are detected using the webcam. Another moto of this project is to control the Indian economy by regulating the streetlight.

3. Robotic Arm Control Using Gesture and Voice

Dr. R. V. Dharaskar, S. A. Chhabria, Sandeep Ganorkar

Human-robot voice interface has a key role in many application fields. Hand gesture is a very natural form of human interaction and can be used effectively in human computer interaction (HCI). In this paper, we propose a "Human Machine Interfacing Device" utilizing hand gestures to communicate with computers and other embedded systems

acting as an intermediary to an appliance. Developments in field of communication have enabled computer commands being executed using hand gestures. This paper discusses hand glove-based techniques that use sensors to measure the positions of the fingers and the position of the hand in real-time.

Interaction using gesture technology for effective communication empowering physically challenged to interact with machines and computing devices including 3-D graphic interactions and simulations. This paper focuses on wireless data gloves that are proposed to be used for gesture recognition and accordingly robot movement will take place

4. Hand Gesture Controlled Robot

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This paper introduce a hand-gesture based control interface for navigating a car-robot. A 3-axis accelerometer is used to record a user's hand gestures. The data is transmitted wirelessly via an RF module to a microcontroller. The received signals are then classified to one of six control commands for navigating a car-robot. The microcontroller then classifies the hand trajectories. Simulation results show that the classifier could achieve a 92.2% success rate .Our gesture-controlled robot works based on accelerometer outputs, which correspond to hand movements and sends that data to a comparator which assigns specific voltage level to the movements. This information is transferred to an encoder which encodes it before RF transmission. On the other end, the information is received wirelessly via RF. These decisions are sent to the motor driver, which triggers the motors in specific configurations to make the robot move in different directions.

III. METHODOLOGY

For designing of an accelerometer based hand gesture controlled robot the AVR ATmega16 microcontroller is used. In this we use our hand gestures as input signals for driving the robot in various direction and the direction of movement of the robot is display on 16X2 alphanumeric LCD. Gesture controlled robot moves according to the user's hand movement recognized by the device in our hand. When we tilt hand in front side, the robot starts to moving forward and continues moving forward until the next command is given. When we tilt hand in the backside, the robot changes its state and start moving in the backwards direction until another command is given. When we tilt it towards the left side, it will turn left till next command. When we tilt our hand in right side robot is turned to the right.

Key Componentes

- Atmega 328 Microcontroller
- Accelerometer
- Battery
- L293d Motor Driver
- Lcd Display
- RF Receiver
- RF Transmitter
- HT12E & HT12D

Circuit Diagram

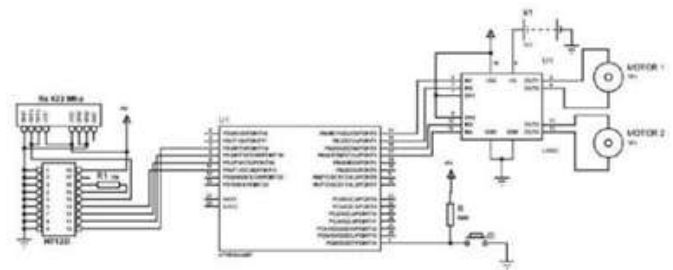


Figure 1: Circuit Diagram of Receiver

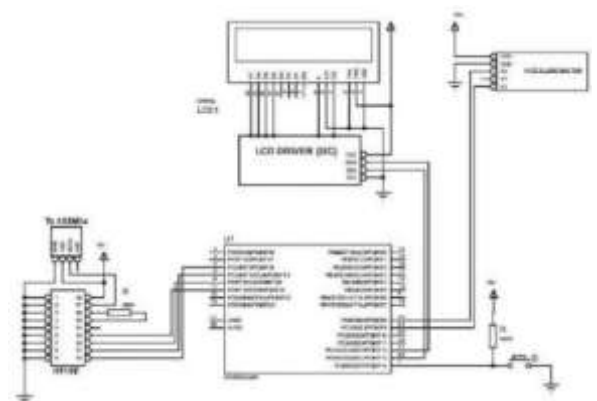


Figure 2: Circuit Diagram of Transmitter

IV. WORKING

The transmitter side of the system consist of accelerometer Rf transmitter, antenna microcontroller. The accelerometer detects the movement or gestures of the hands. Once a gesture is recognized ,the transmitter encodes the information into a suitable form for transmission and the signal is transmitted to receiver through antenna. The antenna in the receiver side of the system is equipped with a corresponding receiver module capable of receiving data transmitted by the transmitter. The receiver decodes it into extract the information about the detected hand gesture. The decoded gesture information is then processed to determine the corresponding action the robot should take. If the gesture indicates "move forward," the receiver prepares commands for the robot motors to move forward. Motor Control: The receiver sends the appropriate

control signals to the robot's motors to execute the desired action based on the interpreted hand gestures.

Working Model



Figure 3: Working Model

V. CONCLUSION

In conclusion, a hand gesture-controlled robot offers a user-friendly interface for interacting with robots, making them accessible to a wider range of users. By utilizing hand gestures, users can control the robot's movements and actions intuitively, without the need for complex input devices. This technology has the potential to revolutionize human-robot interaction, making robots more versatile and easier to use in various applications, from home assistance to industrial automation. With further advancements in gesture recognition and robot autonomy, the possibilities for hand gesture-controlled robots are endless.

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